PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of:

Gurtej S. Sandhu

U.S. Patent No.: 5,231,056

Issued: July 27, 1993

For: TUNGSTEN SILICIDE (WSI_x) DEPOSITION PROCESS FOR SEMICONDUCTOR MANUFACTURE

Reissue Serial No.: To Be Assigned

Attorney Docket No.: 3369US
(91-365.RE)

CERTIFICATE OF MAILING UNDER RULE 1.10

I hereby certify that this correspondence along with any attachments referred to or identified as being attached or enclosed is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service (under 37 C.F.R. § 1.10) (Express Mail Mailing Label Number: EM339601582US) on the date of deposit shown below with sufficient postage and in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

2/12/98
Date of Deposit

Signature of person actually making deposit pursuant to 37 C.F.R. § 1.10(b)

Timothy W. Ricks
Typed/printed name of person whose signature is contained above

REISSUE DECLARATION

Hon. Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The undersigned declarant, Gurtej S. Sandhu, states and declares as follows:

My residence, post office address, and citizenship are as set forth at the end of this DECLARATION by my signature above my typed name.

I believe myself to be an original, first and sole inventor of the subject matter which is now claimed and for which a reissue patent is sought on the invention entitled TUNGSTEN SILICIDE (WSI_x) DEPOSITION PROCESS FOR SEMICONDUCTOR MANUFACTURE, an application for which was filed in the U.S. Patent and Trademark Office on January 15, 1992 and assigned Serial No. 07/821,188, which subsequently issued as U.S. Patent No. 5,231,056 on July 27, 1993.

I have reviewed and understand the contents of the above-identified specification, including the claims, being claims 1-15 as originally issued in U.S. Patent No. 5,231,056, claims 1-15 as now amended, and new claims 16-32 as first presented in the Reissue

Application filed herewith. Upon information and belief, the original patent is partly inoperative by reason of my claiming more than I had a right to claim in originally-issued claims 1-15 of U.S. Patent No. 5,231,056.

On July 26, 1995, a broadening reissue application was filed (serial no. 08/506,952, now abandoned). In response to this broadening reissue, the Examiner rejected the claims which were presented for various reasons under 35 U.S.C. §§ 112, 102(b), and 103. The rejection under Section 102(b) relied upon a Japanese reference, JP-39528 - Kawanishi et al. ("the Kawanishi reference"), which was not previously known to the Applicant.

The Kawanishi reference relates to first forming a thin layer of WSi_2 on a substrate with SiH_4 and WF_6 gas and forming a thicker layer of WSi_2 on the thin layer of WSi_2 with SiH_2Cl_2 and WF_6 gas. This disclosure, in broad terms, is believed to be sufficiently similar to the broadest claims of the originally-issued claims 1-15 of U.S. Patent No. 5,231,056 to warrant narrowing such claims.

Originally-issued process claim 1 has now been amended to recite a process of depositing a tungsten silicide film on a substrate wherein a film of tungsten silicide is deposited on a nucleation layer of tungsten silicide "at a temperature of less than about 500°C". This amendment is supported by the specification at column 4, lines 6-9. The deposition of the film of tungsten silicide at such a low temperature is neither taught nor suggested in the Kawanishi reference.

Originally-issued process claim 2, which depends from claim 1, has been amended to correct an inadvertent typographical error. Specifically, the term "hexafluoride" has been substituted for the misspelled term "hexaflouride".

Originally-issued process claim 3 has been amended to depend from claim 1 rather than claim 2.

Originally-issued process claim 4 has been amended to depend from claim 1 rather than claim 3.

Originally-issued process claim 5 has been amended to depend from claim 1 rather than claim 4.

Originally-issued process claim 6 has been amended to depend from claim 1 rather than claim 5.

Originally-issued process claim 7 has been amended to depend from claim 1 rather than claim 6.

Originally-issued semiconductor manufacturing process claim 8 has been amended to recite a process of depositing a tungsten silicide film on a substrate wherein a film of tungsten silicide is deposited on a nucleation layer "at a temperature of less than about 500°C". This amendment is supported by the specification at column 4, lines 6-9. As discussed above, the deposition of the film of tungsten silicide at such a low temperature is neither taught nor suggested in the Kawanishi reference.

Originally-issued process claim 10 has been amended to depend from claim 8 rather than claim 9.

Originally-issued process claim 11 has been amended to depend from claim 8 rather than claim 10.

Originally-issued process claim 12 has been amended to depend from claim 8 rather than claim 11.

Originally-issued process claim 13 has been amended to depend from claim 8 rather than claim 12.

Originally-issued process claim 14 has been amended to depend from claim 8 rather than claim 13.

Additional claims 16-32 have also been added with this narrowing reissue application. In particular, new claim 16, which depends from claim 1, has been added to claim that both the deposition of the tungsten silicide nucleation layer and the deposition of the tungsten silicide film layer occur at substantially the same temperature. This additional claim finds support in the specification at column 4, lines 6-9.

New claim 17, which depends from claim 8, has been added to claim that both the deposition of the tungsten silicide thin or discontinuous layer and the deposition of the tungsten silicide film layer occur at substantially the same temperature. This additional claim finds support in the specification at column 4, lines 6-9.

New independent claim 18 recites a process for depositing a tungsten silicide film on a substrate in which a nucleation layer of tungsten silicide is deposited on the substrate using a CVD process with a silane silicon source gas and a reactant gas, and in which a film of tungsten silicide is deposited on the nucleation layer using a CVD process by switching to dichlorosilane as a silicon source gas such that the dichlorosilane gas reacts with the reactant gas to form the tungsten silicide film, and wherein the deposition of the tungsten silicide discontinuous layer and the deposition of the tungsten silicide film layer occur at substantially the same temperature. This additional claim is supported by the specification at column 3, lines 57-62, column 4, lines 6-9, and in original claims 5 and 8. The deposition of a

discontinuous nucleation layer of tungsten silicide is neither taught nor suggested in the Kawanishi reference.

New claim 19, which depends from claim 18, defines the reactant gas as tungsten hexafluoride. This additional claim finds support in the specification at column 2, lines 60-63 and in original claims 2 and 9.

New claim 20, which depends from claim 18, defines the CVD process as being conducted in a cold wall reaction chamber. This additional claim finds support in the specification at column 3, lines 4-20 and in original claims 3 and 10.

New claim 21, which depends from claim 18, defines the CVD process as being carried out at a temperature of about 400°C or less. This additional claim finds support in the specification at column 4, lines 6-9 and in original claim 4.

New claim 22, which depends from claim 18, further claims a premix chamber used to mix the silane or dichlorosilane silicon source gas, the reactant gas and a carrier gas. This additional claim finds support in the specification at column 2, lines 60-66 and in original claim 6.

New claim 23, which depends from claim 22, defines the flow rate of the carrier gas as being about five to ten times the flow rate of the silane or dichlorosilane silicon source gas. This additional claim finds support in the specification in original claim 7.

New independent claim 24 recites a semiconductor manufacturing process for depositing a tungsten silicide film on a substrate in which a discontinuous nucleation layer of tungsten silicide is deposited on the substrate using a CVD process with a silane silicon source gas and a reactant gas mixed in a premix chamber, and in which a film of tungsten silicide is deposited on the discontinuous nucleation layer using a CVD process by switching to dichlorosilane as a silicon source gas such that the dichlorosilane gas reacts with the reactant gas to form the tungsten silicide film. This additional claim is supported by the specification at column 3, lines 57-62 and in original claims 5 and 8. Neither the deposition of the discontinuous nucleation layer of tungsten silicide, nor the use of a premix chamber, is taught or suggested in the Kawanishi reference.

New claim 25, which depends from claim 24, has been added to recite that both the deposition of the tungsten silicide discontinuous layer and the deposition of the tungsten silicide film layer occur at substantially the same temperature. This additional claim finds support in the specification at column 4, lines 6-9.

New claim 26, which depends from claim 24, defines the reactant gas as tungsten hexafluoride. This additional claim finds support in the specification at column 2, lines 60-63 and in original claims 2 and 9.

New claim 27, which depends from claim 24, defines the CVD process as being conducted in a cold wall system. This additional claim finds support in the specification at column 3, lines 4-20 and in original claims 3 and 10.

New claim 28, which depends from claim 27, further defines the cold wall system as including the premix chamber, a reaction chamber, a graphite boat for holding a plurality of silicon wafers and means for heating the silicon wafers. This additional claim finds support in the specification at column 3, lines 4-20 and in original claim 11.

New claim 29, which depends from claim 24, defines the substrate as a silicon wafer which are heated to a temperature of between 200° to 500°C. This additional claim finds support in the specification at column 4, lines 6-9 and in original claim 12.

New claim 30, which depends from claim 24, recites the deposition of the nucleation layer occurring in about 1 to about 25 seconds. This additional claim finds support in the specification at column 4, lines 6-9 and in original claim 13.

New claim 31, which depends from claim 24, claims a carrier gas including a mixture of Argon, Nitrogen, and Helium. This additional claim finds support in the specification at column 3, lines 30-32 and in original claim 14.

New claim 32, which depends from claim 31, defines the flow rate of the silane silicon source gas as 400 sccm, the flow rate of the reactant gas as 4 sccm, and the flow rate of the carrier gas as 2800 sccm. This additional claim finds support in the specification at column 3, lines 57-67 and in original claim 15.

The amendments to originally-issued claims 1-15 of U.S. Patent No. 5,231,056 and new claims 16-32 submitted herewith are believed to correct the inoperativeness of the original patent by reason of claiming more than I had a right to claim in the originally-issued patent.

All errors identified and described above, which are being corrected in the reissue application, arose without any deceptive intention on my part.

I acknowledge the duty to disclose to the Patent and Trademark Office all information known to be material to patentability of the subject matter claimed in this application, as "materiality" is defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby appoint the following Registered Practitioners to prosecute this application and to transact all business in the Patent and Trademark Office:

Joseph A. Walkowski, Reg. No. 28,765
Robert G. Winkle, Reg. No. 37,474
Lia M. Pappas, Reg. No. 34,095
James R. Duzan, Reg. No. 28,393
Michael L. Lynch, Reg. No. 30,871

I hereby direct that all correspondence and telephone communications be directed to Joseph A. Walkowski at TRASK, BRITT & ROSSA, P.O. Box 2550, Salt Lake City, Utah 84110, telephone (801) 532-1922.

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: Feb, 5, 1998

Gurtej S. Sandhu

Inventor's Full Name:	Gurtej S. Sandhu
Country of Citizenship:	United Kingdom
Residence Address:	2964 East Parkriver Drive Boise, Idaho 83706
Post Office Address:	same as above

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of:

Gurtej S. Sandhu

U.S. Patent No.: 5,231,056

Issued: July 27, 1993

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Reissue Serial No.: To Be Assigned

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2/12/98
Date of Deposit

Signature of person actually making deposit pursuant to 37 C.F.R. § 1.10(b)

Timothy W. Ricks
Typed/printed name of person whose signature is contained above

REQUEST TO CHANGE CORRESPONDENCE ADDRESS (37 C.F.R. § 1.33(d) and ASSOCIATE POWER OF ATTORNEY (37 C.F.R. § 1.34(b) with STATEMENT PURSUANT TO 37 C.F.R. § 3.73

Hon. Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

In accordance with 37 C.F.R. § 1.33(d), please change the address for all purposes in connection with the above-identified patent and direct all communications to:

JOSEPH A. WALKOWSKI
TRASK, BRITT & ROSSA
P. O. Box 2550
Salt Lake City, Utah 84110
(801) 532-1922

In accordance with 37 C.F.R. § 1.34(b), please recognize the following individuals as associate attorney:

David V. Trask, Reg. No. 22,012
William S. Britt, Reg. No. 20,969
Thomas J. Rossa, Reg. No. 26,799
Laurence B. Bond, Reg. No. 30,549
Joseph A. Walkowski, Reg. No. 28,765
James R. Duzan, Reg. No. 28,393
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Edgar R. Cataxinos, Reg. No. 39,931
Michael L. Lynch, Reg. No. 30,871
Lia M. Pappas, Reg. No. 34,095

Pursuant to 37 C.F.R. § 3.73(b), the undersigned representative of the Assignee has reviewed the evidentiary documents, specifically the Assignment (copy attached) to Micron Technology, Inc. recorded on February 10, 1992 as Reel 6011, Frames 0355-0356, and certifies that to the best of his knowledge and belief, title remains in the name of Micron Technology, Inc.

The undersigned further avers that he is empowered to make and sign the foregoing certification on behalf of the Assignee, and to take the action set forth herein on behalf of the Assignee, pursuant to a resolution of its Board of Directors.

Respectfully submitted,

MICRON TECHNOLOGY, INC.

Dated: Feb 5, 1998

By: _____

Michael L. Lynch, Esq.
Reg. No. 30,871
Chief Patent Counsel, an authorized representative empowered to grant the foregoing power of attorney

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Gurtej Singh Sandhu

Serial No.: 07/821,188

Filed: January 15, 1992

Attorney Docket: 11004.41

For: TUNGSTEN SILICIDE (WSi_x) DEPOSITION PROCESS FOR SEMICONDUCTOR MANUFACTURE

Examiner:

Group Art Unit: 1104

ASSIGNMENT:

__X__ Enclosed for recording
____ Previously recorded
Date: _____
Reel: _____

A S S I G N M E N T

FOR GOOD AND VALUABLE CONSIDERATION, the receipt, sufficiency, and adequacy of which are hereby acknowledged, the undersigned do hereby:

SELL, ASSIGN, AND TRANSFER to Micron Technology, Inc. (The "Assignee"), a corporation of Delaware, having a place of business at 2805 East Columbia Road, Boise, Idaho 83706, the entire right, title, and interest for the United States and all foreign countries, in and to any and all improvements which are disclosed in the application for United States Letters Patent, which has been executed by the undersigned concurrently herewith and is entitled: **TUNGSTEN SILICIDE (WSi_x) DEPOSITION PROCESS FOR SEMICONDUCTOR MANUFACTURE**, such application and all divisional, continuing, substitute, renewal, reissue, and all other applications for patent which have been or shall be filed in the United States and all foreign countries on any of such improvements; all original and reissued patents which have been or shall be issued in the United States and all foreign countries on such improvements; and specifically including the right to file foreign applications under the provisions of any convention of treaty and claim priority based on such application in the United States of America;

AUTHORIZE AND REQUEST the issuing authority to issue any and all United States and foreign patents grated on such improvements to the Assignee;

WARRANT AND COVENANT that no assignment, grant, mortgage, license, or other agreement affecting the rights and property herein conveyed has been or will be made to others by the undersigned, and that the full right to convey the same as herein expressed is possessed by the undersigned;

COVENANT that, when requested and at the expense of the Assignee, to carry out in good faith the intent and purpose of this assignment, the undersigned will execute all divisional, continuing, substitute, renewal, reissue, and all other patent applications on any and all such improvements; execute all rightful oaths, declarations, assignments, powers of attorney, and other papers; communicate to the Assignee all facts known to the undersigned relating to such improvements and the history thereof; and generally do everything possible which the Assignee shall consider desirable for securing, maintaining, and enforcing proper patent protection for such improvements and for vesting title to such improvements in the Assignee;

TO BE BINDING on the heirs, assigns, representatives, and successors of the undersigned and extend to the successors, assigns, and nominees of the Assignee.

(Signature) Gurtej Singh Sandhu Date: 1/10/98

Gurtej Singh Sandhu

STATE OF IDAHO)
) ss.
COUNTY OF Ada)

BEFORE ME, this 10 day of January, 1998, personally appeared the above named individual, to me known to be the person who is described in and who executed the foregoing assignment instrument and acknowledged to me that he executed the same of his own free will for the purpose therein expressed.

SEAL

Deanne Schiedau
Notary or Consular Officer of the United States of America

Commission expiration:
6/27/96

Docket: 11004.41
0102g.tas

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